CASE REPORT

Bonding Technologies in Young Permanent Molars: A Case Series

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Abstract

Introduction: Dental caries has been the most common disease affecting the human population. Once cavitated, the disease requires restoration. Dental adhesives used to bond composite resins to tooth structure have evolved over the last several decades. Composites were developed to meet the requirements of durable esthetics restorative material. The process of bonding occurred due to micromechanical interlocking between hydroxyapatite of enamel and resin. Over a period of time, bonding to enamel has become a reliable procedure. However, bonding to dentin has proven to be less predictable. In order to overcome the challenges, dental adhesive systems have evolved through several generations with changes in chemistry, mechanism, number of bottles, application techniques, and clinical effectiveness.

Case details: The "self-etch" system is especially attractive to pediatric dentistry because of its "fewer steps" and "lesser time." One product launched as a self-etching self-adhesive flowable composite Constic (DMG, Germany), a new three- in -one flowable composite that combines etching gel, bonding agent, and flowable composite in one single product which has multiple benefits over conventional products. Such a material can be of true advantage as it allows for single-step application, less technique sensitivity, and reduced chair time. In light of this knowledge, this paper will focus on two commonly performed procedures in the general practitioner's office, that is, the placement of small class I composite resin restorations and the placement of pit and fissure sealants on permanent molars in pediatric patients.

Clinical significance: The advantage of this material is less technique sensitivity and reduced chair time.

Keywords: Bonding agent, First permanent molars, Pit and fissure sealants, Self-etch systems.

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Introduction

Permanent posterior teeth with deep pit and fissure are more prone to dental caries. Deep pits and fissures act as habitant to microorganisms, making the cleaning procedures difficult and allows greater plaque accumulation,[1,2] especially in the newly erupted teeth. Hence, the pits and fissures become the primary site for the initiation of dental caries, and if unchecked, they soon become cavitated that need to be restored with a biologically compatible restorative material after unnecessarily cutting the tooth material also.

Among the various restorative materials available, silver amalgam was considered to be a gold standard a few decades ago, but inherent limitations of amalgam, such as mercury toxicity and the need of an extension for prevention, has become a cause of concern.[3] Moreover, the demand for increased esthetics also has become the choice; thereby, the advent of esthetically predominant restorative material demand also increased. With the advancement of acid etching and natural tooth-colored materials, mainly composites, have become the mainstay of restorative dentistry.

In order to avoid excessive tooth cutting, bonding of composite resin to the tooth which is based on adhesion, has become the choice of an hour.[4] Composite bonds micromechanically with enamel following acid etching and to dentin using dentin bonding agents. Dentin adhesion is not well-founded as that with enamel due to the histological, morphological, and compositional differences.[5]

Recent advances have concentrated on the evolution of simplified systems that involve single-step delivery[6]. The trend started with the introduction of fifth and sixth generation bonding agents. Fifth generation dentinal adhesives comprised of two bottle systems containing etchant in one and primer and bonding agent in another.[7] Similarly, the seventh generation also has two bottles or one bottle package that needs to be mixed before application.[5]All-in-one and self-etch are the most recent revolution in the dental adhesive system. Even though separate etching and rinsing are not required, they are capable of conditioning the tooth surface and preparing it for adhesion, thereby reducing the chair side time. The reduced technique sensitivity and clinical operation time make this material more favorable in pediatric dentistry.[7]

One such product launched recently as Constic (DMG, Germany) is available as a single syringe tube. It is indicated for small/shallow class I cavities and allows for polymerization to a depth of ≤2 mm.

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Such a material can be considered of true advantage in children as it allows for single-step application, less technique sensitivity, and reduced chair time.[8]

In light of this knowledge, this article will focus on and depict two clinical cases which are performed commonly in general practice, that is, small class I cavity and pit and fissure sealant.

Case Description

Case 1

Conservative Occlusal Composite Technique

A case of 13-year-old boy presented with a decayed tooth in the maxillary posterior region in the Department of Pediatric and Preventive Dentistry, DAV Dental College, Yamunanagar, Haryana, India (Fig. 1). Clinically, the tooth had international caries detection and assessment system code 5 carious lesion (distinct cavity with visible dentin). A radiographic examination revealed the extension of caries into dentin; however, the tooth was vital and asymptomatic. Esthetic restorative treatment was planned using a self-adhesive flowable composite. The patient and his guardian were explained about the restorative option available and informed consent was taken. The manufacturer's instructions were strictly followed for the procedure.

The Following Steps were Followed for Restoration (Figs 1A to E)

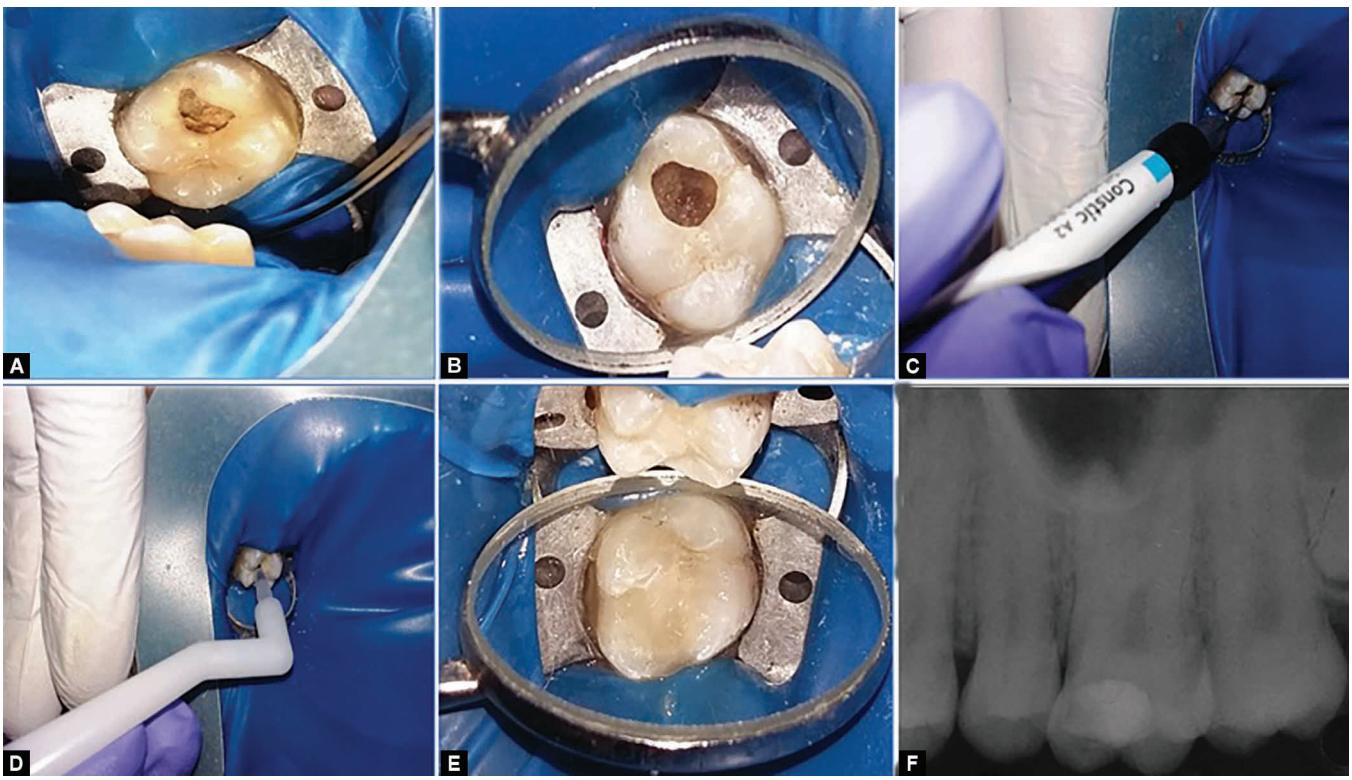
Step 1: Isolation of Tooth and Excavation of Caries The carious tooth was isolated using a rubber dam and isolation was maintained during the entire process (Fig. 1A). Caries were removed by using high-speed air rotary instruments with the help of a long number 245 bur blade[6] depending on the depth of the carious lesion, and superficial carious tissue was excavated from the deep dentinal lesion using spoon excavator (Fig. 1B). After complete excavation of caries, a cotton swab was used to sweep out the debris.

Step 2: Application of Self-etching Self-adhesive Composite (Constic) The cavity was restored with the commercially available single syringe system—Constic (DMG, Germany). The material was applied onto the cavity surface with the aid of the Luer lock tip (available within the kit) by pressing the syringe (Fig. 1C). A thin layer (≈ 0.5 mm) was then spread out on all the cavity wall for 25 seconds using the applicator tip (available within the kit) (Fig. 1D) and then light cured with a well-controlled light-emitting diode (LED) light—unit (450 nm) for 20 seconds. This was followed by the build up of more material to fill-up the cavity. A layer of maximum 2 mm thickness was added at one line and each layer was light cured individually for 20 seconds.

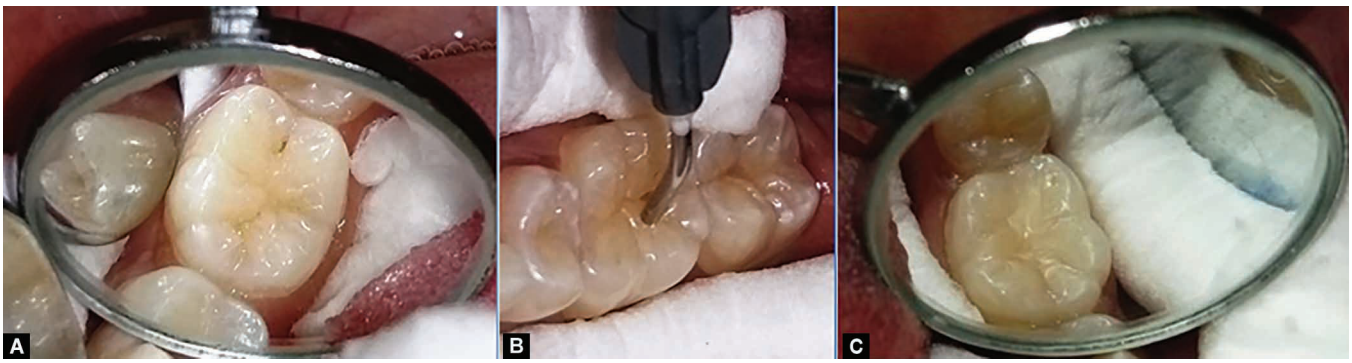
Step 3: Contouring and Polishing of the Composite Then tooth was checked for occlusal discrepancies by asking the patient to bite on an articulating paper. Trimming of the restoration was done with slow speed, medium, and fine diamond burs. Final finishing was done using a composite finishing kit (Fig. 1E). Patient was recalled after 1 month and then 6 months to check for the integrity of the restoration clinically and radiographically (Fig. 1F).

Case 2

The second patient in this series was of the application of self-etching self-adherence of flowable composite as an occlusal sealant. An 8-year-old female patient reported to the Department of Pedodontics and Preventive Dentistry, DAV Dental College and Hospital, Yamunanagar, Haryana, India, for a regular dental checkup and full mouth preventive regime. On examination, it was observed that the pit and fissures on all permanent molars were deep with



Figs 1A to F: Placement of small class I composite resin restorations



Figs 2A to C: Placement of pit and fissure sealants

stains, making them prone to caries. Thus, as a preventive regime, it was decided to place pit and fissure sealants on all the erupted permanent molars using self-etching self-adherence of flowable composite, Constic (DMG, Germany).

Clinical Technique for Placement of Pit and Fissure Sealant (Fig. 2)

Step 1: Isolation of Tooth and Cleaning of Tooth The teeth were isolated using a cotton roll and isolation was maintained during the entire process (Fig. 2A). The occlusal surfaces were cleaned with a pumice of slurry.

Step 2: Application of Self-etching Self-adhesive Composite (Constic) Self-etching self-adhesive composite (Constic) was applied to the entire surface of the fissure with the help of Luer lock tip by pressing the syringe and massaging a thin layer over the entire surface for 25 seconds using the applicator tip and light cured with a well-controlled LED light—unit (450 nm) for at least 20 seconds (Fig. 2B).

Step 3: Explore the Sealed Tooth Surface and Evaluate Occlusion A probe was walked over the sealed surface to make sure the marginal seal between the sealant and the tooth surface. Further, the occlusion was checked with the help of an articulating paper and high points were reduced to eliminate the occlusal interference (Fig. 2C). The patient was recalled after 1 month to check for the integrity of the sealant.

Discussion

The rising demand for esthetics among patients has brought natural tooth-colored material in the market. Conventional materials like silicates and acrylics have been replaced by more promising and esthetic materials like composites. Composite bonds micromechanically with enamel following acid etching and to dentin using dentin bonding agents. Dentin adhesion is not well-founded as that with enamel due to the histological, morphological, and compositional differences.[9,10] The ideal characteristics of a bonding system include biocompatibility, sufficient bond strength, fracture resistance, and easy to use. Various dentin bonding systems were introduced but none of them met the ideal requisite, as they were complicated, time-consuming, and involved various clinical steps.[11]

Constic, a new self-etching and self-adhering flowable composite, permits the clinician to carry out small class I occlusion restorations, and it can also be used as pit and fissure sealants, as shown in Figures 1 and 2, respectively. It is a faster, easier, and more efficient treatment process. It minimizes potential sources of mistakes. It prevents postoperative sensitivity. It removes the extra step of etching/priming/bonding, which were considered important in conventional resin-based composite system. Such a material can be of true advantage in children as it allows for single-step application, less technique sensitivity, and less chair time.

Conclusion

This study describes a technique using Constic (DMG) flowable composite with multiple uses. Being a self-etching and self-adhering, it increases the acceptance for both the clinician and the patient. The properties shown by this material can be used to the clinician's advantage for restoring cavities in pediatric patients.

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